

REMARKS

Status of the Claims

Claims 48 and 49 have been amended to more clearly define the invention and Claims 50-81 have been canceled without prejudice, in response to a Restriction requirement, subject to applicant's right to file a divisional application directed to the non-elected claims while the current application is still pending. In addition, applicants have added new Claim 82-100, which are directed to the invention elected, as defined by the Claims in Group I, so that Claims 1-49 and 82-100 are now pending in the application.

Restriction Requirement and Election

The Examiner has indicated that this application contains claims directed to two groups of patentably distinct inventions, including Claims 1-49 (Group I), which are directed to a contactless energy transfer device, and Claims 50-81 (Group II), which are directed to a contactless battery charging device/method. The primary difference between the two inventions is that the battery charger includes a conditioning circuit, which is not required in the energy transfer device. The Examiner indicates that restriction is proper because the inventions are classified differently, and the inventions (which are related as sub-combinations disclosed as being usable together in a single combination) are separately usable, and therefore distinct.

In response to this Restriction, applicants hereby affirmatively elect the invention of Group I (Claims 1-49), without traverse.

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Preliminary Amendment

The Examiner is correct that Claims 48 and 49 should depend from Claim 47. A Preliminary Amendment making that correction is included hereinabove.

In this Preliminary Amendment, applicants have also added Claims 82-100, corresponding to a method of transferring energy (contactless). These claims do not recite the steps of conditioning a current and recharging a battery and are thus directed to the first invention identified by the Examiner (Group I), which has been affirmatively elected. The steps recited in the new method claims are fully disclosed in the specification as filed.

Respectfully submitted,

Ron Anderson

Ronald M. Anderson
Registration No. 28,829

I hereby certify that this correspondence is being deposited with the U.S. Postal Service in a sealed envelope as first class mail with postage thereon fully prepaid addressed to: Director of Patents and Trademarks, Arlington, VA 22202, on April 7, 2003.

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MARKED-UP VERSION OF THE AMENDMENTS

Amendment to the Claims

In the Claims:

Please cancel Claims 50-81.

Please amend Claims 48 and 49 as follows:

48. (Amended) The energy transfer apparatus of Claim [51]47, wherein the flux shunt comprises a bar of magnetically permeable material that extends over the opposite p 1 faces of the permanent magnet in at least one orientation, as the flux shunt is moved by the prime mover.

49. (Amended) The energy transfer apparatus of Claim [51]47, wherein the magnetic field generator includes a plurality of permanent magnets, and a fixed flux linkage bar coupling magnetic flux between different pole faces of the plurality of permanent magnets, said flux shunt periodically being moved over opposite pole faces of the plurality of permanent magnets to produce the varying magnetic field.

Please add new Claims 82-100 as follows:

--82. A method for transferring energy by inductively coupling a varying magnetic field produced in a first portion of a base component to a receiver coil disposed in a first portion of a receiver component, without interfering with electronic components disposed in a second portion of the receiver component, comprising the steps of:

(a) positioning the first portion of the receiver component proximate the first portion of the base component;

(b) positioning the second portion of the receiver component proximate a second portion of the base component, such that the second portion of the base component substantially supports the second portion of the receiver component, and such that the first portion of the receiver component and the second portion of the receiver component do not substantially overlap, and such that the first portion of the base component and the second portion of the base component do not substantially overlap;

(c) generating a magnetic field with a permanent magnet disposed in the first portion of the base component;

(d) coupling a driving force to an element in the base component so that the element is movable; and

1 (e) moving the element with the driving force to produce a varying magnetic field
2 produced by the permanent magnet, the varying magnetic field being inductively coupled to the
3 receiver coil disposed within the first portion of the receiver component, causing and inducing a
4 corresponding electrical current to be induced in the receiver coil; such that the varying magnetic field
5 so produced does not substantially overlap the second portion of receiver component. ;

6 83. The method of Claim 82, wherein a source of the driving force is disposed remote
7 from where the magnetic field is generated by the permanent magnet and is coupled to the
8 element through a driven shaft.

9 84. The method of Claim 82, wherein the magnetic field is generated by a plurality of
10 permanent magnets.

11 85. The method of Claim 82, wherein the element that is moved comprises said
12 permanent magnet.

13 86. The method of Claim 85, wherein the step of moving the element comprises th
14 step of rotating the permanent magnet to vary a magnetic flux produced by the permanent
15 magnet along a path that includes the receiver coil.

16 87. The method of Claim 85, wherein the step of moving the element comprises the
17 step of reciprocating the permanent magnet back and forth to vary a magnetic flux along a path
18 that includes the receiver coil.

19 88. The method of Claim 82, further comprising the step of enhancing a magnetic flux
20 linkage between magnetic poles of the permanent magnet and the receiver coil.

21 89. The method of Claim 88, wherein the step of enhancing the magnetic flux linkage
22 comprises the step of providing a flux linkage bar for coupling a magnetic field from a pole of
23 the permanent magnet into the receiver coil.

24 90. The method of Claim 82, further comprising the step of selectively varying a
25 maximum magnetic field intensity coupled with the receiver coil.

26 91. The method of Claim 90, wherein the step of selectively varying the maximum
27 magnetic field intensity comprises the step of varying a position of the permanent magnet
28 relative to the receiver coil to control the magnetic field coupled to the receiver coil.

29 92. The method of Claim 90, wherein the step of selectively varying the maximum
30 magnetic field intensity comprises the step of changing a speed with which the element moves.

93. The method of Claim 82, wherein the magnetic field is generated with a plurality of permanent magnets, and wherein the moving element comprises the plurality of permanent magnets, further comprising the step of moving one of the permanent magnets, and magnetically coupling another of the plurality of permanent magnets to the permanent magnet that is moved, so that the other of the plurality of permanent magnets is moved thereby.

94. The method of Claim 82, wherein the magnetic field is generated with a plurality of permanent magnets that are fixed relative to the base component, and wherein the step of moving the element comprises the step of intermittently passing a flux shunt member adjacent to pole faces of the plurality of permanent magnets so as to provide a magnetic flux shunt path between the pole faces of the plurality of permanent magnets, to produce the varying magnetic field.

95. The method of Claim 82, wherein the magnetic field is generated with a plurality of permanent magnets, and wherein the plurality of permanent magnets are moved laterally back and forth past the receiver coil to vary the magnetic field.

96. The method of Claim 82, wherein the magnetic field is generated with a plurality of permanent magnets, and wherein the plurality of permanent magnets are radially movable on a support that is rotated to produce the varying magnetic field, further comprising the steps of:

(a) forcing the plurality of permanent magnets toward each other when the support is at rest to reduce a startup torque required to begin rotating the support; and

(b) adjusting a separation between the plurality of permanent magnets when the support is rotated, to change a magnitude of the magnetic field coupled to the receiver coil.

97. The method of Claim 90, wherein the step of selectively varying the maximum magnetic field intensity comprises the steps of:

(a) providing a plurality of turns of a conductor wound around said permanent magnet; and

(b) causing an electrical current to flow through the plurality of turns of the conductor to selectively adjust a maximum value of the magnetic field produced by said permanent magnet, said electrical current producing a magnetic field that either increases or reduces the magnetic field generated by the permanent magnet.

98. The method of Claim 82, wherein the first portion of the receiver component extends outwardly from the second portion of the receiver component.

99. The method of Claim 98, wherein the first portion of the receiver component comprises an antenna.

100. The method of Claim 82, wherein the receiver component comprises a portable device.--

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